IBM High IOPS SSD PCIe Adapters

IBM System x at-a-glance guide

The IBM High IOPS SSD PCIe Adapters provide a new generation of ultra-high-performance storage based on solid state device technology for System x and BladeCenter. These adapters are alternatives to disk drives and are available in several sizes, from 160 GB to 1.2 TB. Designed for high-performance servers and computing appliances, these adapters deliver throughput of up to 300,000 I/O operations per second (IOPS), while providing the added benefits of lower power, cooling, and management overhead, and a smaller storage footprint.

The IBM 320GB High IOPS SSD PCIe Adapter is shown in Figure 1.

Figure 1. The IBM 320GB High IOPS SS and MS Class SSD PCIe Adapter

Did You Know?

These adapters use flash memory as the storage medium, contain no moving parts, and do not have the issues associated with vibration, noise, and mechanical failure. The adapters are built as block devices on a PCIe bus with advanced wear-leveling, advanced ECC, and N+1 chip-level redundancy, providing unparalleled reliability and efficiency.

Part number information

Table 1 lists the ordering part numbers and feature codes.

Table 1. Ordering part numbers and feature codes

Description	Part number	Feature code
IBM 160GB High IOPS SS Class SSD PCIe Adapter	46M0877	0096
IBM 320GB High IOPS MS Class SSD PCIe Adapter	46M0898	1649
IBM 320GB High IOPS SD Class SSD PCIe Adapter	46M0878	0097
320GB High IOPS SLC Adapter for IBM System x	81Y4535	A1NE
640GB High IOPS MLC Adapter for IBM System x	81Y4531	A1NC
640GB High IOPS MLC Duo Adapter for IBM System x	81Y4519	5985
640GB High IOPS SLC Duo Adapter for IBM System x	81Y4539	A1ND
1.28TB High IOPS MLC Duo Adapter for IBM System x	81Y4527	A1NB

The part numbers for the adapters include the following items:

- One PCIe adapter with 3U bracket
- 2U bracket (except for the Duo adapters, 81Y4519, 81Y4539, and 81Y4527)
- Quick install guide
- Documentation on a USB key
- Safety flyer

Figure 2 shows the 640GB High IOPS SLC Duo Adapter for IBM System x

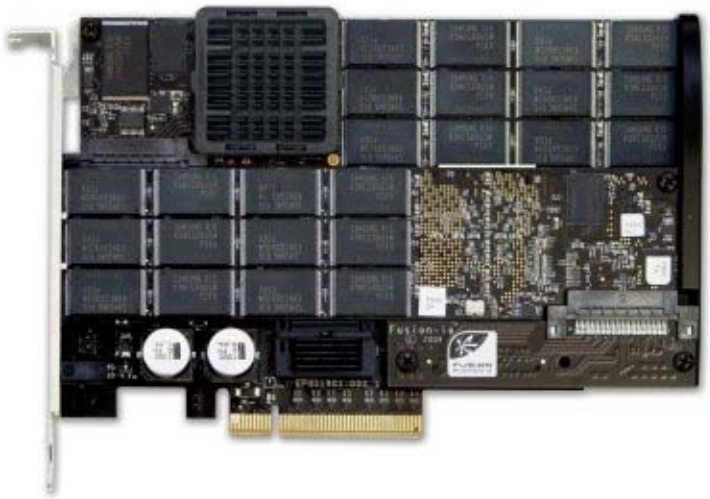

Figure 2. 640GB High IOPS SLC Duo Adapter for IBM System x

Features

Based on standard PCIe architecture coupled with silicon-based NAND clustering storage technology, the High IOPS Adapters are optimized for System x racks and can be deployed in blades via the PCIe expansion units. These scalable designs come with both Single Level Cell (SLC) and MultiLevel Cell (MLC) technologies in standard PCIe form factors. While MLC offers a cost-effective alternative, SLC provides over 12X more endurance and up to 30% better performance over MLC.

These adapters use NAND flash memory as the basic building block of solid-state storage and contain no moving parts, thus they are less sensitive to issues associated with vibration, noise, and mechanical failure. These adapters are built as block devices on a PCIe bus with advanced wear-leveling, ECC, and N+1 chip-level redundancy providing unparalleled reliability and efficiency.

Typical uses are applications with ultra-high performance I/O needs:

- Data-in-memory applications
- Medium to large databases
- Cache
- Video
- Data warehousing
- Business intelligence and analytics
- Decision support

The IBM High IOPS SSD PCIe Adapters have the following features:

Performance features:

- High performance - 230 times better IOPS. That means, for example, 97,014 IOPS at 4K block random reads versus 420 IOPS for a 15K RPM 146GB disk drive.
- Low latency of 50 µs - 1% of the latency of a 15K RPM 146GB disk drive.
- 600 MB/s random writes sustained.

Reliability features:

- Predictable lifetime.
- Up to 25 years of data retention.
- N+1 redundancy built-in to ensure data protection
- Available in SLC or MLC
- 11-bit ECC protection.
- Advance bad-block management algorithms enable taking blocks out of service when their failure rate becomes unacceptable.
- IBM High IOPS Launch Manager management suite.

Energy efficiency features:

- Low power consumption for performance: 9W delivering 100,000 IOPS versus 5.5W for 420 IOPS from a 15K RPM 146GB disk drive.
- Only 57 kWh/yr at 100,000 IOPS sustained.

Specifications

The IBM High IOPS SSD PCIe Adapters have the following specifications:

- Storage capacity from 160 GB to 1.28 TB
- Functions as a PCIe storage and controller device -- operating system sees a block device
- PCI Express host interface as listed in Table 2

Note: These adapters cannot be used as bootable devices.

Table 2. PCI Express host interface specification

Description	Part number	PCIe interface
IBM 160GB High IOPS SS Class SSD PCIe Adapter	46M0877	PCIe 1.0a (Gen1) x4
IBM 320GB High IOPS MS Class SSD PCIe Adapter	46M0898	PCIe 1.0a (Gen1) x4
IBM 320GB High IOPS SD Class SSD PCIe Adapter	46M0878	PCIe 2.0 (Gen2) x8
320GB High IOPS SLC Adapter for IBM System x	81Y4535	PCIe 1.0a (Gen1) x4
640GB High IOPS MLC Adapter for IBM System x	81Y4531	PCIe 1.1 (Gen1) x4
640GB High IOPS MLC Duo Adapter for IBM System x	81Y4519	PCIe 2.0 (Gen2) x8
640GB High IOPS SLC Duo Adapter for IBM System x	81Y4539	PCIe 2.0 (Gen2) x8
1.28TB High IOPS MLC Duo Adapter for IBM System x	81Y4527	PCIe 2.0 (Gen2) x8

Comparison

Table 3 shows a comparison between the High IOPS SSD PCIe Adapters and solid-state drives.

Table 3. Comparison

	High IOPS SSD PCIe Adapters								Solid-state drive	
Model	**160 SLC**	**320 MLC**	**320 SLC**	**320 SLC Duo**	**640 MLC**	**640 MLC Duo**	**640 SLC Duo**	**1.28 MLC**	**eXFlash 1.8" 50GB MLC** (8 drives)	**eXFlash 1.8" 200GB MLC** (8 drives)
Part number	46M0877	46M0898	81Y4535	46M0878	81Y4531	81Y4519	81Y4539	81Y4527	43W7726	43W7746
Capacity	160 GB	320 GB	320 GB	320 GB	640 GB	640 GB	640 GB	1.28 TB	400 GB	1.6 TB
Max IOPS 4KB Read	129K	128K	189K	301K	129K	301K	358K	316K	Non-RAID: 203K RAID 5: 121K	
Max IOPS 4KB Write	130K	108K	154K	110K	136K	109K	374K	277K	Non-RAID: 140K RAID 5: 22K	
Max transfer Read	754 MBps	735 MBps	787 MBps	1524 MBps	763 MBps	1703 MBps	1538 MBps	1511 MBps	Non-RAID: 2052 MBps RAID 5: 1668 MBps	
Max transfer Write	635 MBps	476 MBps	769 MBps	1129 MBps	543 MBps	961 MBps	1047 MBps	818 MBps	Non-RAID: 1864 MBps RAID 5: 1141 MBps	

Physical specifications

Table 4 lists the dimensions and weight of each card.

Table 4. Physical specifications

Adapter	Dimensions
IBM 160GB High IOPS SS Class SSD PCIe Adapter IBM 320GB High IOPS MS Class SSD PCIe Adapter 320GB High IOPS SLC Adapter for IBM System x 640GB High IOPS MLC Adapter for IBM System x	Height: 1.6 cm (0.625 in) Width: 7.0 cm (2.75 in) Depth: 16.8 cm (6.625 in) Weight: 138 g (0.3 lb)
IBM 320GB High IOPS SD Class SSD PCIe Adapter 640GB High IOPS MLC Duo Adapter for IBM System x 640GB High IOPS SLC Duo Adapter for IBM System x 1.28TB High IOPS MLC Duo Adapter for IBM System x	Height: 1.6 cm (0.625 in) Width: 11.0 cm (2.75 in) Depth: 17.0 cm (6.625 in) Weight: 279 g (0.61 lb)

Operating environment

The adapters are supported in this environment:

- Temperature:
  - 10° to 35°C (50° to 95°F) at 0 to 914 m (0 to 3,000 ft)
  - 10° to 32°C (50° to 32°F) at 914 to 2,133 m (3,000 to 7,000 ft)
- Relative humidity:
  - 20% to 80% (non-condensing)

Warranty

The IBM High IOPS SSD PCIe Adapters have a three-year limited warranty.

Supported servers

The IBM High IOPS SSD PCIe Adapters are supported in the IBM System x servers listed in Table 5.

Table 5. Supported System x servers (Part 1)

Adapter		x3100 M3	x3200 M2	x3200 M3	x3250 M2	x3250 M3	x3400 M2	x3400 M3	x3500 M2	x3500 M3	x3550	x3550 M2	x3550 M3	x3620 M3
IBM 160GB High IOPS SS Class SSD	46M0877	N	N	N	N	N	N	N	N	N	N	N	Y	N
IBM 320GB High IOPS MS Class SSD	46M0898	N	N	N	N	N	N	N	N	N	N	N	Y	N
IBM 320GB High IOPS SD Class SSD	46M0878	N	N	N	N	N	N	N	N	N	N	N	Y	N
320GB High IOPS SLC Adapter	81Y4535	N	N	N	N	N	N	N	N	N	N	Y	Y	Y
640GB High IOPS MLC Adapter	81Y4531	N	N	N	N	N	N	N	N	N	N	Y	Y	Y
640GB High IOPS MLC Duo Adapter	81Y4519	N	N	N	N	N	N	N	N	N	N	Y	Y	Y
640GB High IOPS SLC Duo Adapter	81Y4539	N	N	N	N	N	N	N	N	N	N	Y	Y	Y
1.28TB High IOPS MLC Duo Adapter	81Y4527	N	N	N	N	N	N	N	N	N	N	Y	Y	Y

Table 5. Supported System x servers (Part 2)

Adapter		x3630 M3	x3650 T	x3650 M2	x3650 M3	x3655	x3690 X5	x3755	x3755 M3	x3850 M2	x3950 M2	x3850 X5	HS22	HX5
IBM 160GB High IOPS SS Class SSD	46M0877	N	N	Y	Y	N	Y	N	N	Y	Y	Y	Y*	N
IBM 320GB High IOPS MS Class SSD	46M0898	N	N	Y	Y	N	Y	N	N	Y	Y	Y	Y*	N
IBM 320GB High IOPS SD Class SSD	46M0878	N	N	Y	Y	N	Y	N	N	Y	Y	Y	N	Y†
320GB High IOPS SLC Adapter	81Y4535	Y	N	Y	Y	N	Y	N	N	N	N	Y	N	N
640GB High IOPS MLC Adapter	81Y4531	Y	N	Y	Y	N	Y	N	N	N	N	Y	N	N
640GB High IOPS MLC Duo Adapter	81Y4519	Y	N	Y	Y	N	Y	N	N	Y	Y	Y	Y*	N
640GB High IOPS SLC Duo Adapter	81Y4539	Y	N	Y	Y	N	Y	N	N	N	N	Y	N	N
1.28TB High IOPS MLC Duo Adapter	81Y4527	Y	N	Y	Y	N	Y	N	N	N	N	Y	N	N

* The HS22 supports these adapters with the addition of the IBM BladeCenter PCI Express I/O Expansion Unit (PEU3e), part number 43W4391
† The HX5 supports these adapters with the addition of the IBM BladeCenter PCI Express Gen 2 Expansion Blade (BPE4), part number 46M6730

See IBM ServerProven for the latest information on the adapters supported by each System x server type: http://ibm.com/servers/eserver/serverproven/compat/us/.

Supported operating systems

The IBM High IOPS SSD PCIe Adapters support the following operating systems:

- Microsoft Windows Server 2003/2003 R2, Datacenter x64 Edition
- Microsoft Windows Server 2003/2003 R2, Enterprise x64 Edition
- Microsoft Windows Server 2003/2003 R2, Standard x64 Edition
- Microsoft Windows Server 2008 R2
- Microsoft Windows Server 2008, Datacenter x64 Edition
- Microsoft Windows Server 2008, Enterprise x64 Edition
- Microsoft Windows Server 2008, Standard x64 Edition
- Microsoft Windows Server 2008, Web x64 Edition
- Microsoft Windows Small Business Server 2008 Premium Edition
- Microsoft Windows Small Business Server 2008 Standard Edition
- Red Hat Enterprise Linux 5 Server with Xen x64 Edition
- Red Hat Enterprise Linux 5 Server x64 Edition
- Red Hat Enterprise Linux 6 Server x64 Edition
- SUSE LINUX Enterprise Server 10 for AMD64/EM64T
- SUSE LINUX Enterprise Server 10 with Xen for AMD64/EM64T
- SUSE LINUX Enterprise Server 11 for AMD64/EM64T
- SUSE LINUX Enterprise Server 11 with Xen for AMD64/EM64T

Related publications

For more information refer to these documents:

- IBM High IOPS SSD PCIe Adapters documentation
  - *IBM High IOPS SSD Management Application*
  - *Release Notes*
  - *User Guide for Linux*
  - *User Guide for Windows*

  http://ibm.com/support/entry/portal/docdisplay?lndocid=MIGR-5083907
- IBM High IOPS SSD PCIe Adapters product page
  http://www.ibm.com/systems/storage/disk/ssd/ssd_adapters.html
- IBM US Announcement Letters
  http://ibm.com/common/ssi/cgi-bin/ssialias?infotype=dd&subtype=ca&&htmlfid=897/ENUS109-396
  http://ibm.com/common/ssi/cgi-bin/ssialias?infotype=dd&subtype=ca&&htmlfid=897/ENUS111-051
- *IBM System x Configuration and Options Guide*
  http://www.ibm.com/support/docview.wss?uid=psg1SCOD-3ZVQ5W

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